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United Nations Economic and Social Information System

Draft standards of the United Nations Economic and Social Information System for data structure and metadata in international data exchange and dissemination

Report of the Secretary-General

Summary

The agenda item entitled "United Nations Economic and Social Information System" was added to the provisional agenda for the present session of the Statistical Commission by the Commission's Working Group on International Statistical Programmes and Coordination, which requested the present progress report.

The United Nations Economic and Social Information System (UNESIS) is a comprehensive project of the United Nations Statistics Division, in cooperation with the regional commissions and other parts of the global statistical system, to re-engineer its basic statistical data system so as to respond to new user demands, using new client-server and network technologies. The Division has developed for UNESIS a standard processing and software architecture and metadata standards and is applying them in the current biennium to its production databases in national accounts, demographic statistics, and energy and industrial statistics. It is also developing a UNESIS Common Database to provide on-line access through the Internet to a large core of harmonized and integrated data and metadata from over 20 sources throughout the United Nations system.

This report describes the present state of development of the system and its components, especially the development of metadata standards, the objectives for the system over the next two years, and cooperation in development undertaken with the regional commissions and national experts. The report is presented for information.

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Introduction

1. The Working Group on International Statistical Programmes and Coordination of the Statistical Commission at its nineteenth session decided to add the item entitled "United Nations Economic and Social Information System (UNESIS)" to the agenda of the Statistical Commission at its thirtieth session and requested a report on development of UNESIS standards for data structure and metadata in international data exchange and dissemination. The present report has been prepared in response to that request.[1] It provides an overview of the objectives and work programme of, and progress of work on, UNESIS and describes the uses and organization of metadata in the system.

2. This report is submitted to the Commission for information.

I. Overview of UNESIS

3. UNESIS is establishing a renewed economic and social statistical information system in the United Nations Secretariat. It will be the primary platform for compilation and dissemination of demographic, national accounts, energy, industry and environment statistics and general statistical databases and indicators in the period 2000–2001. As described in the 1998–1999 programme of the United Nations Statistics Division, UNESIS as an information system is to encompass data collection, processing, storage and exchange and dissemination of economic and social information to users for policy-making purposes. The expected results are improvement in the usefulness and accessibility of international economic and social data and metadata to international and national policy makers. These results are to be achieved through the development and application of new data-processing, network and quality control technologies to enhance coverage, reliability and timeliness in collection, processing and dissemination.

4. In developing UNESIS, the Division is taking a fresh look at how it compiles, analyses and disseminates economic and social statistics in order to utilize new technologies to meet new user needs. In this, the Division is working closely with suppliers, compilers and users of data in the other divisions of the Department of Economic and Social Affairs of the United Nations Secretariat, the regional commissions and international organizations.

5. Several priority user concerns have been identified in meetings of the Statistical Office of the European Communities (Eurostat), the Economic Commission for Europe (ECE) and national experts on electronic data dissemination systems. There is a strong consensus that data users on the Internet expect access to current, reliable data that is rapid, uncomplicated and more complete with respect to standardized metadata and that uses uniform presentation formats and interfaces.[2]

6. Thus, the priority objectives of UNESIS are:

(a) Ready access to information by users in the Secretariat at all duty stations, and by users in the global statistical system, in Governments and among non-governmental organizations and the global public;

(b) Order-of-magnitude improvements in the timeliness of data dissemination through redesigning production and dissemination processes and taking full advantage of new technologies;

(c) Increased productivity and more systematic quality control in statistics production and dissemination;

(d) Standardization of metadata in UNESIS and harmonization of metadata in UNESIS with metadata in the global statistical system.

II. UNESIS at the end of 1998

7. UNESIS comprises a wide range of specific activities and objectives, consisting of several closely related database projects using common hardware and software standards, architecture and metadata. Its main component projects and their current statuses are described briefly below.

A. The production databases

8. The basic statistical building blocks in UNESIS are the production databases which comprise data received from countries, mainly through questionnaires. Each production database in UNESIS builds on established practices in data checking and tabulation in the United Nations Statistics Division in each field for data reported by countries. The current statuses of the production databases in UNESIS are as follows:

(a) The National Accounts Yearbook Database, comprising data reported by countries in national currencies to the United Nations Statistics Division, ECE and Eurostat, is fully operational. Preparations for the changeover to the 1993 *System of National Accounts*[3] in 1999 are to be completed in the first quarter of 1999;

(b) The Demographic Yearbook Database, comprising population data reported by countries, is to be fully operational by the end of 1999;

(c) Work is to begin in the fourth quarter of 1998 on the commodity production statistics and energy statistics databases, and in 1999 on a new environment statistics database.

B. UNESIS Common Database

9. The UNESIS production databases plus a variety of other sources are used for compilation of the UNESIS Common Database, which is intended for harmonization and dissemination of data in a single unified framework rather than data production in specific, specialized fields. The Common Database comprises a comprehensive core of data from the global statistical system. A trial version of the Common Database was completed in a prototype, desktop version in the spring of 1998 and a complete beta version fully incorporating the UNESIS standards is to be implemented at the end of 1998.

C. UNESIS support systems

10. Several important ancillary systems have been developed as common "support" systems in UNESIS. These are:

(a) A database for country/area and economic and social groupings nomenclature and coding, completed in early 1998;

(b) A support program for producing camera-ready output for printing traditional yearbook tables, completed for national accounts data in 1998. It will be adapted for other UNESIS print outputs in 1999;

(c) Data export facilities in file formats suitable for user analytical work, estimates, projections and models, such as the American Standard Code for Information Interchange (ASCII), spreadsheet, the statistical package for the social sciences (SPSS) and Ivation (Beyond 20–20), and for the Internet are being developed as part of user interface work in 1998–1999.

III. Metadata standards and guidelines

11. The meetings organized by the Conference of European Statisticians and national experts on dissemination databases and metadata identified several key problems in implementing such databases for public use on the Internet.[4] Drawing on the experience and conclusions of these meetings, particular priority is being given to achieving consistency and transparency of statistical methods across countries and among national and international sources through the following metadata objectives:

(a) Sound citation and bibliographic practices;[5]

(b) Replicability and verifiability of data and estimates for research;

(c) Open access to data and metadata using the Internet;

(d) Integration of metadata and data in electronic databases;

(e) Achievement of inter-database consistency in concepts, classifications and definitions;

(f) Documenting of national and international differences in concepts, classifications and definitions used relative to international standards and best practices.[6]

A. International standard concepts and definitions

12. All of the concepts, classifications, definitions and methods of calculation in UNESIS are being fully documented in the relational database management system (RDBMS), drawing on the international statistical standards on which they are based. This documentation, including the original text of the applicable international standards, will also be available as an integral part of the dissemination systems. In 1998, the compilation of authoritative metadata relating to international statistical standards is being implemented for the UNESIS Common Database and in 1999–2000 will be extended to the production databases in UNESIS.

13. The principal unit of compilation in the Common Database is the "infotype". The infotype can be thought of as a label for a statistical series with disaggregation according to one classification or "dimension", or several closely related classifications. In practice, it corresponds closely to a printed or spreadsheet cross-tabulation. It may comprise a single datum per country/area per year, such as gross domestic product (GDP) or total population, or several thousand items, such as value of commodity exports by commodity.

14. The concept of infotypes was developed for the Common Database to establish a standard method of identifying, organizing and labelling statistical series across many different sources and types of data. The identification and selection of sources and infotypes for the Common Database and the associated metadata therefore comprise the

heart of the UNESIS metadata system as concerns data coverage and description. For the first full-scale trial version of UNESIS using the Division's Sybase standard RDBMS platform, approximately 350 infotypes have been designed working from the original source databases. These, with their associated metadata, comprise a standard reference for harmonizing global statistics dissemination and these standard metadata and documentation systems will be applied in the UNESIS production databases in 1999–2000.

15. Annex table A presents a summary of the coverage of the infotypes so far selected and developed by the Division, with the source database indicated. The complete list is maintained for reference and comment at the Statistics Division's Internet site <www.un.org/Depts/unsd/> under "UNESIS". The first-round selection of infotypes has been made primarily with a view to identifying the series most in demand by users. For this purpose, the Division has consulted the other international statistical agencies, the regional commissions, data users in the Department of Economic and Social Affairs of the United Nations Secretariat, a range of international business publications that also publish economic series, and users of the Division's general publications, the *Statistical Yearbook*, the *Monthly Bulletin of Statistics* and *World Statistics Pocketbook*.[7] Of course, practical considerations have limited the number and complexity of the series that could be prepared for the first complete trial version of the Common Database and the Common Database is intended in any case to comprise only a small portion of the series in the original sources.

16. The second component of metadata for infotypes in the Common Database consists of the dimensions that specify the items and classifications in each infotype. Annex table B lists the dimensions, mainly classifications, used in the Common Database and the source citations for the international standards on which they are based. From the source material cited for the dimensions and other international standards where available, standard definitions of all of the statistical terms and concepts found in the infotype labels and dimensions will be compiled in a "data dictionary".[8] Complete definitions of the terms frequently comprise formulae and rules used for calculations and derivations of various kinds from some underlying basic series. These texts will also be fully integrated into the UNESIS database and dissemination formats. National differences in applying these international standard concepts, classifications and definitions in their data for international dissemination will be noted in the UNESIS databases and these notes will be carried over into the dissemination formats as footnotes.

17. It is thus a fundamental data-handling principle in UNESIS that the complete metadata always accompany the data through different parts of the system and outputs, and are fully documented and readily accessible.

B. Dissemination formats

18. Organization of data and metadata for dissemination refers to the design and organization of viewing and presentation formats for the client, and electronic data export formats. A fundamental example of the former which becomes very complex in practice is the definition and design of the elements of a table for a user, where a table is taken to be any set of specified rows and columns of data, with arrays from 1×1 to $n \times m$. For export in electronic formats, on the other hand, technical output standards for data export to popular commercial programmes such as Lotus 1–2–3 and spreadsheets, database programs and analytical programs such as SPSS are set by the destination programs, and the output format must be designed to accommodate them.

19. In the case of tables, after the items of data desired for making up a given output table are clearly and unambiguously specified using the definitions and classifications coded into the database, the presentation of data to the user must still be carried out with a great deal of supporting information from the complete set of metadata fields before the result can be considered acceptable. The elements of information required must be clearly specified and provided for as part of the basic, automated functioning of the overall system in order for the output system to be able to prepare automatically the complete output for the user.

C. Source citation

20. Some examples of citation guidelines and formats for national and international data sources are given by the International Monetary Fund (IMF) and the United Nations Statistics Division on their Internet sites ("Dissemination Standards Bulletin Board" and "Special Data Dissemination Standards", at <http://dsbb.imf.org>; and "National statistics sources", at <http://www.un.org/Depts/unsd/>).

21. The UNESIS standard will be the citation of printed or other permanent, public sources in order to ensure that users can find the source indicated at any future date. These sources should be specific as to page or table used as well as provide the standard citation information on place published, publisher, date and author (or responsible office).

D. Footnotes

22. Footnotes in UNESIS can be associated with one cell only. If it is associated to a label in a dissemination database, it must be carried into all cells to which that label applies in order to avoid its becoming detached from applicable data when data are selectively accessed. Footnotes should be used primarily to indicate deviations of the data from the international standard definitions attached to the fixed labels under which they appear.

E. Notice of copyright and permitted uses

23. The treatment of copyright issues and permitted uses is beyond the scope of this report. However, UNESIS will incorporate a copyright notice and statement of permitted uses in all its outputs.

F. Access, output and interface systems

24. Access, output and interface systems comprise "soft" metadata in the sense that a wide variety of techniques can be used in a good interface system to achieve good results. These techniques are, in principle, independent of the database itself though of course in practice they should be developed and tested to work closely together. Examples are interface screens, search engines, navigation systems, key word indexes and other tools now coming into wide use and being extensively refined on the World Wide Web.

25. Research and user reaction to statistics on the Internet (or, for example on compact disk read-only memory (CD-ROMs) which can work in much the same way) have shown clearly that the interface and navigation systems and related tools make the difference between widespread user acceptance and rejection. There are typically significant numbers of users who are accustomed to working with statistics in electronic files and are specialized in particular fields, and for whom data access is such a high priority that they are willing and able to go through an extensive learning process to access and use the data effectively; now, however, by far the great majority of Internet users have less strongly motivated interests in statistics or training in specialized fields using statistics. If interface and navigation systems do not work quickly and easily to enable members of this broader audience to locate, find, understand and use data that meet their needs, particularly where payment is involved, they will very quickly move on to other sources.

26. A full consideration of appropriate navigation and help techniques and their implementation in UNESIS has only just begun. While metadata such as those described here are fundamental to implementing such systems, the metadata must be invoked with effective and easy searching, indexing and explanatory tools. This design effort, like many other aspects of data dissemination in the age of the Internet, requires an unprecedented degree of cooperation of designers, programmers, statisticians, users and managers in order to work. This is the current challenge facing not only UNESIS but virtually the entire global statistical community.

IV. Collaboration with the regional commissions

27. The statistics divisions of the United Nations regional commissions are uniquely placed to ensure close, continuous communication with national statistical services on countries' most recent data availability and on details of national sources, methods and definitions. The UNESIS project team is collaborating with the regional commissions to take advantage of this regional experience. In 1998–1999 missions are scheduled to all of the regional commissions to review developments in UNESIS and in regional statistical databases from technical and substantive points of view. The objectives of this regional collaboration are to ensure commonality of data to the greatest extent possible at regional and global levels, much quicker updating and availability and minimizing of demands on national services for international data compilation. UNESIS on the Internet will provide a nearly real-time focal point for international data sharing and exchange with the regional commissions in a common format and using common metadata standards.

28. In its collaboration with the regions, the UNESIS development team is also working to share technical experience in development of statistical databases for internal and external users and to harmonize and integrate the technical standards in UNESIS and regional databases systems as much as possible.

V. UNESIS in 2000–2001

29. In 2000–2001 UNESIS will address the following major challenges:

(a) User demand for rapid data delivery on the Internet, that is to say, for principal monthly and quarterly series to be available within one month after the end of the

period, and principal annual series within one quarter after the end of the year. The principal means of the United Nations Statistics Division for reporting monthly and quarterly data is the *Monthly Bulletin of Statistics* and *MBS On-line*.[9] MBS will be brought into UNESIS in the year 2000 and new reporting procedures developed with countries to ensure more up-to-date and comprehensive country reporting;

(b) Uniformity of series disseminated internationally through consistent use of standardized concepts and methods. The most important means for accomplishing this key objective will be use of UNESIS on the Internet as a focal point for continuous "real time" dialogue with regions and countries on data updates and revisions;

(c) Documented quality control systems that set objectives and standards for improving the reliability of disseminated data outputs and provide greater and more systematic information to users on quality and reliability of data;

(d) Electronic systems for reporting data to international organizations, and for data exchange. Building on experience with the Generic Statistical Message (GESMES), standard electronic reporting formats for UNESIS that meet country needs will be developed for the United Nations Statistics Division's questionnaires.

Notes

[1] Report of the Working Group on International Statistical Programmes and Coordination on its nineteenth session (E/CN.3/1999/20), para. 36.

[2] See, for example, Eurostat (1993), Netherlands, Statistics Netherlands (1996), United Nations, Conference of European Statisticians (1995, 1997; 1997; 1998), United Nations Statistics Division (1997a, 1998a) and United States Department of Commerce, Bureau of Economic Analysis, Eurostat and International Statistical Institute (1997).

[3] United Nations publication, Sales No. E.94.XVII.4.

[4] See especially United Nations, Conference of European Statisticians (1998).

[5] See, for example, United Nations Statistics Division (1997e).

[6] See, for example, International Monetary Fund, Statistics Department; and Organisation for Economic Cooperation and Development (1997).

[7] United Nations Statistics Division (1997a, 1997b and 1998b).

[8] A partial list of terms appears in United Nations Statistics Division (1997c).

[9] United Nations sales publication, Series Q, and Internet subscriber service, <www.un.org/Depts/unsd>.

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Annex

Table A. Sources and coverage of infotypes in the UNESIS Common Database, Version 0.5 (1998/1999)

acquired immunodeficiency syndrome (AIDS) cases (21)*
agricultural, fish, food and fertilizer production (1)
area (surface) of countries or areas (10)
balance of payments (4)
birth rate (8)
births (10)
book production (18)
cellular phones (5)
cinemas (18)
cities—urban agglomerations (10)
civil aviation traffic (with the International Civil Aviation Organization) (17)
commodities production based on International Standard Industrial Classification of All Economic Activities (ISIC) (12)
consumer price indexes (3)
consumer prices index (4)
death rate (8)
deaths by sex, age group and cause (10)
development assistance, official net, provided and received (6)
development finance indicators to be specified (20)
development grant expenditures by agency of the United Nations system (7)
development indicators to be specified (19)
divorce (10)
drinking water access (21)
earnings by sex and industry groups (3)
earnings index (4)
economically active population by sex and industry groups, estimates and projections, 1950–2025 (2)
educational attainment by sex and level (18)
educational enrolments by sex and level, field of study (18)
educational expenditures (18)
education of population (10)
employment by sex and industry (3)
energy production and consumption, exports and imports (11)
estimates and projections, 1950–2025 (2)
exchange rates (4)
exports and re-exports by partner, Standard International Trade Classification (SITC/Rev.2), two-digit (9)
exports and re-exports of merchandise by industry groups, aggregates in US$ (13)
exports prices and unit value indexes (4)
fertility rate, total (8)
forest area and wood production (1)
households (10)
illiteracy (18)
IMF, national funding positions (4)

* Numbers in parentheses refer to the source databases listed at the end of the table.

import prices and unit value indexes (4)
imports of merchandise by industry groups, aggregates in US$ (13)
industrial share prices indexes (4)
infant mortality rate (8)
interest rates (4)
international financial flows (4)
life expectancy (10)
life expectancy estimates (8)
literacy of population (10)
livestock (1)
marital status (10)
maternal mortality (21)
migration, net (8)
money supply (4)
motor vehicle registration (17)
national accounts aggregates estimates (4)
national accounts estimates of main aggregates and trends, including estimates in US$ (14)
national accounts statistics provided by countries according to the United Nations/OECD questionnaire (15)
newspapers and periodicals (18)
patents (22)
population by age group and sex, estimates and projections, 1950–2025 (8)
population by single years of age, age groups and sex (10)
producer price indexes by category of products (16)
producer prices index (4)
production indexes by industry (12)
reproduction rate (8)
research and experimental development expenditures and personnel (18)
reserves of monetary authorities (4)
sanitation facilities access (21)
telefax stations (5)
telephone lines (5)
television receivers (18)
tourism expenditures and receipts (23)
tourist arrivals (23)
unemployment (3)
United Nations/OECD questionnaire (15)
urban and rural population (10)

Source databases

1. Food and Agriculture Organization of the United Nations Database
2. International Labour Office Estimates and Projections of the Economically Active Population
3. International Labour Office Year Book of Labour Statistics Database
4. International Monetary Fund: International Financial Statistics
5. International Telecommunication Union
6. OECD Development Assistance Database
7. United Nations Operational Activities for Development Database

8. Population Division of the United Nations Secretariat, Population Estimates and Projections
9. United Nations Statistics Division Commodity Trade Statistics Database
10. United Nations Statistics Division Demographic Yearbook Database
11. United Nations Statistics Division Energy Statistics Database
12. United Nations Statistics Division Industrial Commodities Production Database and index numbers
13. United Nations Statistics Division International Trade Statistics Aggregates
14. United Nations Statistics Division National Accounts Estimates
15. United Nations Statistics Division National Accounts Yearbook Database
16. United Nations Statistics Division Producer Price Index Numbers
17. United Nations Statistics Division Transport Statistics Database
18. United Nations Educational, Scientific and Cultural Organization (UNESCO) Statistical Yearbook
19. World Bank: Development Indicators
20. World Bank: Global Development Finance
21. World Health Organization and United Nations Health Indicators
22. World Intellectual Property Organization Statistics Database
23. World Tourism Organization Statistics Database

Table B. International statistical standards used in the UNESIS Common Database source databases

Age groups. United Nations (1958, 1982, 1998a)
Age in single years. United Nations (1958, 1998a)
Agricultural commodities. United Nations (1994)
Base years. Kendall and Buckland (1982). The standard base year in UNESIS is 1990
Book subjects. UNESCO (1964, 1984, annual)
Causes of death. United Nations (1993)
City proper/agglomeration. United Nations (1998a)
Commodities based on ISIC. United Nations (Series P, annual)
Countries or areas. United Nations (1996)
Development assistance (agencies). United Nations (1998b)
Development assistance (bilateral/multilateral). Organisation for Economic Cooperation and Development (annual)
Economic activity status. United Nations (1998b)
Educational level. United Nations Educational, Scientific and Cultural Organization (1978)
Energy type. United Nations (1987)
Families per household. United Nations (1998a)
Family type. United Nations (1998a)
Fields of study. United Nations Educational, Scientific and Cultural Organization (1978)
Foreign-born/native. United Nations (1958)
Government functions. United Nations and others (1993)
Head of household, relation to. United Nations (1998a)
Household (individual) consumption by purpose. United Nations and others (1993, table 18.1)
Household type and size. United Nations (1998a)
Industry branches (ISIC/Rev.2). United Nations (1968)
Industry branches (ISIC/Rev.3). United Nations (1990)
Industry branches (SNA/ISIC). United Nations and others (1993, table 15.3)
Industry groups. United Nations (1968)
Land area. United Nations Economic Commission for Europe, Conference of European Statisticians (n.d.)
Literacy/illiteracy. United Nations Educational, Scientific and Cultural Organization (1978)
Livestock type. Food and Agriculture Organization of the United Nations (1994)
Marital status. United Nations (1998a)
Newspaper periodicity. United Nations Educational, Scientific and Cultural Organization (1964, 1984, annual)
Not economically active status. United Nations (1998a)
Occupation. International Labour Office (1990)
Reproductive rates. United Nations (1958)
Sex. United Nations (1958)
Status in employment. United Nations (1998a)
Trade commodities (SITC/Rev.2), two-digit, three-digit and selected groups. United Nations (1981)
Urban and rural residence. United Nations (1993, 1998a)

References for annex table B

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